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Kinetic Alfvén Waves in the Primary Solar Wind: Shaping Our Understanding in the PSP and Solar Orbiter Era

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Solar wind, teeming with Alfvenic turbulence, serves as an ideal natural plasma environment for exploring the kinetic mysteries of kinetic Alfven waves (KAWs). In this presentation, we'll delve into the latest exciting advancements in KAW observations and physics, enabled by the in-situ measurements of young solar wind by the Parker Solar Probe (PSP) and Solar Orbiter in the inner heliosphere and near the outer solar corona. We'll focus on several key aspects of KAWs. First, we'll present the distinct signatures of KAWs identified in measurement data. Analyzing their probability distribution and power spectral density distribution in the wavenumber space helps us understand the combined impact of anisotropic cascading and inhomogeneous propagation of Alfven-wave-like turbulence in the young solar wind. We'll also explore the occurrence of KAWs in relation to Alfvenic pulses and magnetic switchbacks, and their potential role in energizing solar wind ions across the boundaries of these Alfvenic pulses. Finally, we'll look ahead to future efforts in integrating the propagation, cascading, and dissipation of KAWs into advanced wave-driven solar wind theoretical models.

References

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